

Response to the Final Office Action Dated October 2, 2003
Serial No. 09/633,671

REMARKS

In the Final Office Action, the Examiner noted that claims 1-6 are pending in the application, and that claims 1-6 are rejected. By this response, claims 1-6 continue unamended. In view of the following discussion, the Applicants submit that none of the claims now pending in the application is made obvious under the provisions of 35 U.S.C. §103. In addition, the Applicants incorporate by reference the arguments presented in the Response dated July 23, 2003 in response to the Office Action dated April 23, 2003. Thus, the Applicants believe that all of these claims are now in allowable form.

REJECTION OF CLAIMS UNDER 35 U.S.C. § 103

The Examiner rejected claims 1, 4, 5, and 6 as being obvious over Logan Jr. (United States Patent No. 5,379,309, issued January 3, 1995) ("Logan") in view of Wong et al. (U.S. Patent No. 6,208,444 issued March 27, 2001) ("Wong"); claim 2 as being unpatentable over Logan in view of Wong and further in view of Hohimer et al. (U.S. Patent No. 5,349,601 issued September 20, 1994) ("Hohimer"); and claim 3 as being unpatentable over Logan in view of Wong and further in view of Veselka et al. (U.S. Patent No. 5,963,567 issued October 5, 1999) ("Veselka"). The Applicants respectfully traverse the rejection.

A. Claims 1, 4, 5 and 6

The Examiner rejected claims 1, 4, 5 and 6 as being unpatentable over Logan in view of Wong. The Applicants respectfully disagree.

Logan discloses two independent laser oscillators that forced to be correlated by a mode-locked laser oscillator. The signal from the mode-locked laser is split (using an optical isolator) and injection-locked to continuous-wave ("CW") single-frequency lasers. Subsequently, the outputs from the CW lasers are combined to produce the heterodyne output signal in the microwave to submillimeter wave frequency band.

Specifically, Logan states that:

The output of the mode-locked laser 12 is passed through an optical isolator 14 to prevent reflected power from destabilizing its output, and then split before being coupled into the continuous-wave (cw) single-frequency lasers #1 and #2 (16, 18, respectively). The single-frequency

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lasers #1 and #2 are injection-locked to different longitudinal optical modes of the actively mode-locked laser 12, via frequency-selective tuning elements in their respective cavities. Thus, lasers #1 and #2 each select and amplify only one mode of the multimode output spectrum generated by the actively mode-locked laser 12. See Logan, at col. 4, lines 22-34. (Emphasis added).

To support the rejection of claims, the Examiner combines Wong with Logan. Wong discloses an apparatus for wavelength demultiplexing using a multi-cavity etalon. The apparatus uses cascaded demultiplexers where each level of demultiplexers in the cascade has different wavelength separating capabilities. See Wong at col. 8, lines 18-33.

The Examiner's attention is directed to the fact that Logan and Wong either individually or in any reasonable combination fail to disclose or suggest a novel apparatus for optically generating signals, where the apparatuses or method comprises an optical demultiplexer that is capable of selecting one wavelength for one path and a second wavelength for a second path, as claimed in Applicants' independent claims 1, 5 and 6, respectively. For example, Applicants' independent claims 1, 5, and 6 positively recite:

1. An apparatus for optically generating signals, the apparatus comprising:
 - (a) a mode-locked semiconductor laser that generates mode-locked optical radiation with emitted wavelengths separated by approximately 10 GHz to approximately 300 GHz;
 - (b) an optical demultiplexer with a demultiplexer input, a first demultiplexer output, and a second demultiplexer output, the demultiplexer input being coupled to said mode-locked semiconductor laser, wherein said optical demultiplexer serves as a wavelength separator capable of selecting a first wavelength for said first demultiplexer output and a second wavelength for said second demultiplexer output;
 - (c) an optical modulator having a modulator input and a modulator output, the modulator input being coupled to the first demultiplexer output; and
 - (d) an optical multiplexer having a first multiplexer input, a second multiplexer input, and a multiplexer output, the first multiplexer input being coupled to the modulator output, the second multiplexer input being coupled to said second demultiplexer output. (Emphasis added).

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5. An apparatus for generating optical signals, the apparatus comprising:
 - (a) means for generating mode-locked optical radiation;
 - (b) an optical demultiplexer for separating the generated mode-locked optical radiation into a first signal and a second signal, the first signal and second signal being separated by approximately 60 GHz;
 - (c) means for modulating the first signal, thereby creating a modulated signal; and
 - (d) means for subtracting the difference between the modulated signal and the second signal. (Emphasis added).
6. A method for generating an optical signal, the method comprising:
 - (a) generating a first mode and a second mode in a mode-locked light source;
 - (b) separating the first mode from the second mode by using an optical demultiplexer, wherein said first mode comprises a first wavelength of a light from said mode-locked light source and said second mode comprises a second wavelength of said light from said mode-locked light source;
 - (c) modulating the first mode with data;
 - (d) combining the second mode with the modulate first mode;
 - (e) downconverting the combined second mode and modulated first mode. (Emphasis added).

Applicants' invention is directed to a method and apparatus for creating modulated millimeter-wave signals, thereby providing a high data throughput rate. In one embodiment, the present invention employs an optical demultiplexer where the optical demultiplexer serves as a wavelength separator capable of selecting a first wavelength as a first demultiplexer output and a second wavelength as a second demultiplexer output. (See Applicants' specification, page 3, lines 17-27). Thus the optical demultiplexer selects a specific wavelength for one path and another specific wavelength for another path. This novel and inexpensive approach allows one wavelength traveling along a first path to be modulated with data and the second wavelength to be unmodulated. Finally, the modulated and unmodulated wavelengths can be combined and filtered by an optical multiplexer.

In Logan, the element (i.e., the optical isolator) that forwards the signal to two different lasers is nothing more than a signal splitter. Support for this assertion can be found in Logan at col. 4, lines 22-34, as indicated above. After receiving the split signal, each laser must internally injection-lock to different longitudinal optical modes of

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the signal using frequency-selective tuning elements in their respective cavities. See Logan at col. 4, lines 28-34. In other words, both lasers are operating on the same signal and must internally lock to a desired mode of the signal.

The Applicants direct the Examiner's attention to the fact that the definition of an optical isolator has been presented in Logan. In re Paulsen, 30 F.3d 1475, 1480, 31 USPQ2d 1671, 1674 (Fed. Cir. 1994) (inventor may define specific terms used to describe invention, but must do so "with reasonable clarity, deliberateness, and precision" and, if done, must "'set out his uncommon definition in some manner within the patent disclosure' so as to give one of ordinary skill in the art notice of the change" in meaning). Accordingly, the definition of an optical isolator, as used in Logan's invention and clearly defined in Logan is the definition that the Examiner should use.

The Examiner maintains that it is well known in the art to use a demultiplexer or splitter for separating the optical signals; and that a multiplexer or coupler is well known in the art for combining the optical signals. The Applicants respectfully submit that this is untrue. A splitter provides the same signal to different paths. "Splitters are passive devices that simply split the incoming signal to create two or more identical outgoing signals," Newton's Telecom Dictionary 645 (17th ed. 2001). Hence a splitter and demultiplexer are not interchangeable.

In fact, Applicants' invention by using a demultiplexer is "capable of selecting a first wavelength as a first demultiplexer output and a second wavelength as a second demultiplexer output," and teaches away from Logan which sends the same signal to different lasers.

Thus, Logan's optical isolator clearly does not disclose or suggest Applicants' optical demultiplexer, where the optical demultiplexer serves as a wavelength separator capable of selecting a first wavelength as a first demultiplexer output and a second wavelength as a second demultiplexer output.

The addition of Wong does not correct the shortcomings of Logan. For example, Wong also does not disclose that splitters and demultiplexers are interchangeable.

In rejecting claims under 35 U.S.C. §103, it is incumbent upon the Examiner to establish a factual basis to support the legal conclusion of obviousness. See In re Fine,

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837 F.2d 1071, 1073, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). In so doing, the Examiner is expected to make the factual determinations set forth in Graham v. John Deere Co., 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), and to provide a reason why one having ordinary skill in the pertinent art would have been led to modify the prior art or to combine prior art references to arrive at the claimed invention. Such reason must stem from some teaching, suggestion or implication in the prior art as a whole or knowledge generally available to one having ordinary skill in the art. Uniroyal, Inc. v. Rudkin-Wiley Corp., 837 F.2d 1044, 1051, 5 USPQ2d 1434, 1438 (Fed. Cir.), cert. denied, 488 U.S. 825 (1988); Ashland Oil, Inc. v. Delta Resins & Refractories, Inc., 776 F.2d 281 293, 227 USPQ 657, 664 (Fed. Cir. 1985), cert. Denied, 475 U.S. 1017 (1986); ACS Hosp. Sys., Inc. v. Montefiore Hosp. 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). These showings by the Examiner are an essential part of complying with the burden of presenting a prima facie case of obviousness. Note In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). Applicants respectfully submit that the Examiner fails to provide a prima facie factual basis to support the legal conclusion of obviousness.

Since Logan and Wong either individually or in any reasonable combination fail to disclose or suggest the claimed invention, it is respectfully submitted that the invention of claims 1, 5 and 6 are patentable over the cited reference. Therefore, the Applicants submit that claims 1, 5 and 6, as they now stand, fully satisfy the requirements of 35 U.S.C. §103 and are patentable thereunder. Furthermore, dependent claim 4 depends from claim 1 and recites additional features therefore. At least for its dependency upon independent claim 1, the Applicants submit that claim 4 is not made obvious with respect to the teachings of Logan and Wong. Therefore, the Applicants submit that dependent claim 4 also fully satisfies the requirements of 35 U.S.C. §103 and is patentable thereunder. As such, the Applicants request reconsideration and withdrawal of the obviousness rejection of claims 1, 4, 5, and 6.

B. Claim 2

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The Examiner rejected claim 2 as being unpatentable over the Logan in view of Wong and further in view of Hohimer et al. (United States Patent No. 5,349,601, issued September 20, 1994) ("Hohimer"). The Applicants respectfully disagree.

The arguments previously presented with respect to Logan and Wong in Section A are also applicable to and incorporated into the instant section. For brevity those arguments are not repeated. The combination of Logan and Wong does not render Applicants' independent claim 1 unpatentable. In addition, claim 2 (which depends upon claim 1) contains all the features of claim 1. As such, the Logan and Wong either individually or in any reasonable combination does not render Applicants' claim 2 unpatentable.

Hohimer also does not teach or suggest an optical demultiplexer that serves as a wavelength separator capable of selecting a first wavelength as a first demultiplexer output and a second wavelength as a second demultiplexer output. Thus, this substantial gap is also not bridged by the teaching of Hohimer. Thus, the Examiner has failed to present a prima facie case of obviousness in combining Logan, Wong, and Hohimer to arrive at the claimed invention.

Since the references, either singly or in combination, fail to disclose or suggest the claimed invention, it is respectfully submitted that the invention of claim 2 is patentable over the cited references. Therefore, the Applicants submit that claim 2 fully satisfies the requirements of 35 U.S.C. §103 and is patentable thereunder. As such, the Applicants request reconsideration and withdrawal of the obviousness rejection of claim 2.

C. Claim 3

The Examiner rejected claim 3 as being unpatentable over Logan in view of Wong and further in view of Veselka et al. (United States Patent No. 5,963,567, issued October 5, 1999) ("Veselka"). The Applicants respectfully disagree.

The arguments previously presented with respect to Logan and Wong in Section A are also applicable to and incorporated into the instant section. For brevity those arguments are not repeated. The combination of Logan and Wong does not render Applicants' independent claim 1 unpatentable. In addition, claim 3 (which depends

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upon claim 1) contains all the features of claim 1. As such, the Logan and Wong either individually or in any reasonable combination does not render Applicants' claim 3 unpatentable.

The addition of Veselka does not bridge the gap. Veselka discloses a Mach-Zehnder modulator to generate a periodic amplitude modulation of light. However, Veselka also does not teach or suggest an optical demultiplexer that serves as a wavelength separator capable of selecting a first wavelength as a first demultiplexer output and a second wavelength as a second demultiplexer output. Thus, the Examiner has failed to present a prima facie case of obviousness in combining Logan, Wong, and Veselka to arrive at the claimed invention.

Since the references, either singly or in combination, fail to disclose or suggest the claimed invention, it is respectfully submitted that the invention of claim 3 is patentable over the cited references. Therefore, the Applicants submit that claim 3 fully satisfies the requirements of 35 U.S.C. §103 and is patentable thereunder. As such, the Applicants request reconsideration and withdrawal of the obviousness rejection of claim 3.

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Conclusion

Thus, the Applicants submit that all of these claims now fully satisfy the requirements of 35 U.S.C. §103. Consequently, the Applicants believe that all these claims are presently in condition for allowance. Accordingly, both reconsideration of this application and its swift passage to issue are earnestly solicited.

If, however, the Examiner believes that there are any unresolved issues requiring the issuance of a final action in any of the claims now pending in the application, it is requested that the Examiner telephone Mr. Kin-Wah Tong, Esq. at (732) 530-9404 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Respectfully submitted,

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